Fall 2020 - Syllabus / Lecture Outline

Motivations

Bitcoin has commanded the public's attention: despite over $300 billion invested at its peak, it remains widely unregulated, highly volatile, and poorly understood. Designed in the wake of the 2008 financial crisis, Bitcoin is a digital currency controlled by no single entity. Like the internet in the early 2000's, many remain skeptical of Bitcoin's transformative potential, failing to understand how and why it rethinks traditional financial systems.

In a world where personal lives largely exist as online data, we place blind faith—in people & institutions we have never met—to protect data from malicious actors. Instead, Bitcoin uses a public, transparent record-keeping system, a blockchain, to track ownership and transfer of digital assets without requiring a third-party such as a bank.

Blockchains will allow for trust between participants without the costs of involving "trusted" third-parties, allowing existing social, economic, and political systems to be redesigned in a truly democratic manner. Thus, this course will seek to answer: **how will blockchains empower positive and radical change in our increasingly globalized and data-driven society?**

Students should be prepared for exposure to highly interdisciplinary discussions regarding applying new technology to rethink existing economic & social structures. No technical or engineering experience is required. Classes will involve discussion of supplementary background readings and interactive lectures. For their final assignment, students will submit a proposal for a novel solution utilizing blockchains in a problem space of the student's choice.

Objectives

- **Communicate** the historical contexts and events which motivated the creation and design decisions of blockchains.
- **Summarize** a blockchain's technical nature by identifying components and their respective purposes.
- **Reflect** on a blockchain's principal role as a provider of trust and security in peer-to-peer systems.
- **Evaluate** applications of blockchains as transformative solutions to problems involving information asymmetries in modern economic and social structures.

Assessments

Comprehension Checks and Attendance
To ensure active participation and assess students' ability to apply interdisciplinary concepts to real-world problems, students will be assessed with brief quizzes on material discussed in class. These "exit tickets", collected at the end of every class, can be revised until satisfactory, and will be used for attendance.

Weekly Readings and Online Discussions
Students will be assigned supplementary reading materials related to concepts discussed in class. Readings will include open-ended questions which should be answered before the following class period via Canvas Discussions. Students are encouraged to collaborate with & critique posts from fellow students.

Term Project
To assess their understanding of the principles, motivations, and capabilities of blockchains, students will collaborate (in groups of 2-3) on a term project. Students will choose a problem space of personal interest, assess existing solutions through a historical lens, identify the motivations and criteria for a revised solution utilizing decentralized technologies, and propose a model of this solution.

Attendance & Grading

While subject to the discretion of instructors on a case-by-case basis based on factors including participation and demonstrated effort, grades will be calculated according to the following scale:

Category	**Percentage**
Homework	30%
Attendance	10%
Reading and participation in discussions	20%
Term Project	40%

Instructors

Name	**Email**

James Aman	j.aman@topl.me
Manolo Sanchez	manolo@aya.yale.edu

Office Hours

Day of Week	Location
TBD	Schedule by appointment.

Schedule

. *Scheduled lectures and course content may change at the discretion of the instructors, you will be informed of any updates*

Week	Title	Date	Goal
1	History of Trust, the Web, Networks, and Money	Aug. 24	Trust, Money as code
2	Satoshi's big experiment	Aug. 31	1. Primitives (hash, encryption, P2P networking, signatures) 2. Nakamoto consensus
	— LABOR DAY - NO CLASS --	Sep. 7	
3	Consensus & Industry	Sep. 14	1. BGP & alternatives to proof-of-work 2. Economic incentives 3. Wallets & exchanges
4	Ethereum: A world computer	Sep. 21	1. From stateless to stateful 2. Overview of EVM 3. Contracts example and usage
5	Abstracting blockchain	Sep. 28	1. Layers (blockchain stack) 2. Network forks

			3. Alternative networks
6	Tokenization	Oct. 5	1. Distribution models (ICO, air drop), 2. Token curated registries 3. Nano-payments (Brave, Grid+)
7	Stable coins and DeFi	Oct 12	Case study Maker DAO & Libra
	— MIDTERM RECESS - NO CLASS —	Oct. 19	
8	Privacy coins, protocols, and techniques	Oct. 26	1. Intro to zero knowledge 2. Protocols - Zcash, MimbleWimble, Monero
9	Applications in non-financial services	Nov. 2	1. Supply chains 2. Governance 3. DAOs
10	Zooko's inequality, a challenge of distributed trust	Nov. 9	1. Problems - scalability, centralizatioe 2. Solutions - sidechains, state channels, 3. Technical and organizational challenges
11	Guest Lecture (date may shift) [Topl/Celo]	Nov. 16	
12	Next generation networks pt1	Nov. 23	Scalability • ETH 2.0 • Polkadot • Cardano • Bitcoin Cash • Side chains • Lightning Network Interoperability • Cosmos • Chainlink • cross-chain atomic swaps
13	Next generation networks pt2	Nov. 30	Sustainability (energy/funding/governance) • Cardano

			• proof of stake • ETH 2.0 • foundation • research grants Regulatory & Legal (territoriality/custody) • Libra • global reserve currency • calibra wallet • Tether • Binance • Ripple

Honor Code

The Rice University Honor Code applies to all work in this course. The homework assignment should be done by the students without any outside help. The PowerPoint materials prepared by the instructor and electronically distributed to students are copyrighted materials and may not be distributed to any other person in any form (including, but not limited to, electronic or print copies). Failure to abide by this requirement is regarded to be a serious Honor Code violation and will be reported with a request for consequential action.

Disability-Based Accommodations

Any student with a documented disability desiring accommodations in this class is encouraged to contact me no later than the end of the second week of class, and preferably before. All conversations and correspondence will remain strictly confidential. Additionally, students with documented disabilities must register with Disability Support Services in the Allen Center, Room 111. For more information, visit: http:// dss.rice.edu.

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